

1

3,408,325

**ROOM TEMPERATURE VULCANIZABLE
ORGANOPOLYSILOXANE ELASTOMERS**

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ABSTRACT OF THE DISCLOSURE

A room temperature vulcanizable silicone rubber stock based on a mixture of a siloxane polymer prepared by reacting a hydroxyl endblocked diorganopolysiloxane with the reaction product of a diorganodihalogenosilane with ammonia or certain amines and certain amino substituted organosilanes.

Background of the invention

This invention is in the field of room temperature vulcanizing (RTV) silicone elastomer materials and introduces a novel polymer-crosslinking system.

The recent developments in room temperature vulcanizing silicone rubber stocks have been directed to both the polymer employed and the curing catalysts and crosslinking agents. In general, it is known that certain siloxane polymers having reactive groups bonded to silicon are chemically active toward crosslinking agents in the presence of certain catalysts. These materials cure spontaneously upon mixing and cannot be packaged in a single package hence they are called two-component RTV silicone rubber stocks. In contrast, it is also known that certain siloxanes, particularly hydroxyl endblocked dimethylsiloxanes, can be admixed with certain trifunctional silanes such as alkyltriacyloxysilanes and the mixture is stable until it is exposed to water such as atmospheric water vapor whereupon the material will cure. These materials can be packaged in a single package and do not require further processing by the ultimate consumer and are known as one-component RTV silicone rubber stocks. The present invention is directed to a one-component RTV silicone rubber stock.

The known one-component RTV silicone rubber stocks include mixtures of diorganopolysiloxanes having reactive endgroups or endblockers and aminosubstituted organic silicon compounds having at least three hydrolyzable groups per molecule. These mixtures are known as "amino one-component systems." The amino one-component systems have heretofore suffered the disadvantage of short storage life unless extreme measures are taken to completely exclude water from the ingredients and storage package. The expense incurred in completely drying fillers and other ingredients has inhibited the commercial exploitation of the amino one-component systems. Other disadvantages of the amino one-component systems have included indifferent adhesion to substrates, relatively poor tear strength and the impossibility of preparing such a system which would cure to form a transparent elastomer.

The object of this invention is to introduce a new room temperature vulcanizing silicone rubber composition. A further object is to introduce an amino one component system which is less sensitive to the presence of moisture during storage. A further object is an amino one component RTV silicone rubber system exhibiting good adhesion to substrates, good tear resistance and suitable for

2

use in preparing transparent elastomeric products. Other objects and advantages of this invention are detailed in or will be apparent from the disclosure and claims following.

Summary of invention

This invention relates to a one component room temperature vulcanizable silicone rubber stock which can be stored in the substantial absence of moisture and cures in the presence of water vapor characterized in that the stock is a mixture of (A) a diorganopolysiloxane prepared by reacting (1) a hydroxyl-endblocked diorganopolysiloxane with (2) an amino substituted organosilicon compound prepared by reacting (a) a silane of the general formula R_2SiX_2 wherein each R is a monovalent hydrocarbon radical, halogenohydrocarbon radical or cyanoalkyl radical and X is a halogen atom with (b) ammonia, a primary amine or a secondary amine, and (B) an amino substituted organosilicon compound having at least three hydrolyzable groups per molecule.

Detailed description of invention

The organopolysiloxanes employed herein are well known articles of commerce fully described in the prior art in such patents as U.S. Patents Nos. 2,843,555; 3,105,061; 3,127,363 and 3,294,732. These organopolysiloxanes are essentially linear polymers having hydroxyl endblockers and can be represented by the general formula $(HO)_x(R_ySiO_{4-y/2})_nH$ where x has an average value of 0.99 to 1.01, y has an average value of 1.99 to 2.01 and $x+y$ is 3.0, each R is a monovalent hydrocarbon, halogenohydrocarbon or cyanoalkyl radical and n has a value of at least 3 and preferably at least 50 and does not exceed about 2,000.

The operable siloxane polymers are essentially linear hence are predominantly (i.e. at least 90 mol percent) R_2SiO units. However, limited proportions, preferably below 5 mol percent and most preferably below 2 mol percent of $RSiO_{3/2}$ units, $R_3SiO_{1/2}$ units and/or $SiO_{4/2}$ units can be present. The closer the polymer approaches the R/Si ratio of 2.0/1 the better the ultimate product with the exception that a softer cured rubber essentially free of extractable, uncured polymeric material can be obtained by admixing diorgano functional siloxane polymers having a functional group on each of the terminal silicon atoms with mono-functional siloxane polymers having a functional group on one of the terminal silicon atoms and the other terminal group being an $R_3SiO_{1/2}$ unit.

In the formulae above, each R can be a monovalent hydrocarbon radical of up to 36 carbon atoms. Best results are achieved with hydrocarbon substituents of 1 to 18 carbon atoms. Examples of the radicals represented by R include alkyl radicals such as methyl, ethyl, n-propyl, isopropyl, dodecyl, octadecyl and myricyl, $(-C_aH_{2a+1})$ where a is 1 to 36; alkenyl radicals such as vinyl, allyl, hexenyl and octadecenyl; cycloalkyl radicals such as cyclobutyl, cyclopentyl, cyclohexyl and cyclooctadecyl; cycloalkenyl radicals such as cyclobutenyl, cyclopentenyl, cyclohexenyl and cyclooctadecenyl; aryl radicals such as phenyl, xenyl, naphthyl and phenanthryl, aralkyl radicals such as benzyl, β -phenylethyl and xylyl, and alkaryl radicals such as tolyl and ethylphenyl.

The substituted hydrocarbon radicals represented by R include halogenohydrocarbon radicals such as o-, m- and p-chlorophenyl, and bromophenyl radicals, α,α,α -trifluorotolyl, 3,3,3-trifluoropropyl, $C_bF_{2b+1}CH_2CH_2-$, $(C_bF_{2b+1})_2CH(CH_2)_c-$ and $(C_bF_{2b+1})_3C(CH_2)_c-$ where b is 1 to 12 and c is 1, 2 or 3, chloro-, fluoro- and bromo-derivatives of the various hydrocarbon radicals set forth in the preceding paragraph as well as cyanoalkyl